February 2006 through April 2006 STATUS REPORT

COLISEUM BOULEVARD PLUME INVESTIGATION



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Coliseum Boulevard Plume Investigation

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Plate 1: Concentrations of VOCs in ground-water samples from 100-, 200-, and 300-series monitoring wells collected on April 3 - 27, 2006



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Attachments

Analytical Results Monitoring Well Sampling Forms Conductivity Logs Boring Logs



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Summary

During the period between February 1, 2006, and April 31, 2006, investigations at the Coliseum Boulevard Plume (CBP) site continued.

- Additional site-wide investigations continued near the perimeter of the investigation area and included monitoring well installation, production well abandonment and groundwater sampling at select locations as outlined in Addendum 14 – Additional Site-Wide Investigations. This work is described in Section I of this report.
- Routine monitoring of select ground-water monitoring wells and continuous multichannel tubing (CMT) wells, the Kilby Ditch and the "Low-Lying Area" was conducted in April 2006 in accordance with the approved plans and are summarized in Section II. This report contains results of samples collected through April 31, 2006.

Section III contains a summary of Dehalococcoides bacteria sampling performed during this period.

Section IV contains information about the investigation derived waste and treated water generated during this period.

Section V contains a summary of quality assurance/quality control (QA/QC) samples collected during this period.



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I. Additional Site-Wide Investigation

- February 16 through February 22, 2006: On February 16, 2006, a ground-water sample was collected for VOC analyses from a water production well at the Montgomery Zoo. The sample contained 41.4 μg/L of TCE; 3.5J μg/L of 1-1, dichloroethene (DCE) and 1.1J μg/L of carbon tetrachloride. On February 22, 2006, a subsequent ground-water sample was collected for VOC analyses from the top of a waterfall which was supplied by the production well. The sample contained 37.5 μg/L of TCE; 3.1J μg/L of 1-1, dichloroethene (DCE) and 1.2J μg/L of carbon tetrachloride. Analytical results for the groundwater samples collected from the production well and zoo waterfall are provided in Table 1. The production well at the Montgomery Zoo was reportedly screened within two aquifers present beneath the CBP site. Due to the construction characteristics of the production well, the potential for aquifer cross-contamination existed at the well location.
- March 7 through March 10, 2006: A deep zone monitoring well (MW-357) was installed near the production well at the Montgomery Zoo between March 7 and March 9, 2006, to monitor groundwater beneath the first distinct clay below the water table which occurs beneath the CBP site. The location of monitoring well MW-357 is shown on Plate 1. The monitoring well was installed using Roto-Sonic drilling methods to a total depth of 64 feet BLS (below land surface). Ground-water samples were collected from discrete intervals within the borehole of monitoring well MW-357 during installation, and were analyzed for VOCs (see Table 1 for analytical results and sample intervals). construction characteristics of the monitoring well are included in Table 2. On March 7 and 10, 2006, two probeholes (identified as PH155 and PH156) were installed in selected areas around the perimeter of the Zoo Pond (see Plate 1) to further delineate the outermost boundaries of the TCE plume in this area. Ground-water samples were collected from probeholes PH155 through PH156, and were analyzed for VOCs (see Table 1 for analytical results and sample intervals). The laboratory reports of the analyses performed on groundwater samples collected from monitoring well MW-357 and probeholes PH155 and PH156 and a copy of the soil conductivity and boring logs for the monitoring well and probeholes are provided on the attached CD-R.
- March 9 through March 13, 2006: The production well at the Montgomery Zoo was abandoned in accordance with ADEM Administrative Code R. 335-6-15-.29(8) on March 9 through 13, 2006. The production well, which was reportably constructed to a depth of 163 feet BLS, was over-drilled using Roto-Sonic drilling methods. On March 13, 2006, the borehole of the production well was filled to the land surface with cement-bentonite grout. The procedures for abandonment accounted for the potential for cross-contamination and were approved by the ADEM. The location of the former production well can be referenced on Plate 1.



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- March 14 through March 20, 2006: A deep monitoring well (MW-457) was installed near the former production well at the Montgomery Zoo on March 14 through 20, 2006, to monitor ground-water within the upper Gordo Formation which exist beneath the CBP site. The location of monitoring well MW-457 is shown on Plate 1. The monitoring well was installed using Roto-Sonic drilling methods to a total depth of 147.5 feet BLS. Ground-water samples were collected from discrete intervals within the borehole of monitoring well MW-457 during installation and were analyzed for VOCs (see Table 1 for analytical results and sample intervals). The construction characteristics of the monitoring well are included in Table 2. The laboratory reports of the analyses performed on the surface water sample collected from the Zoo Pond and groundwater samples collected from the borehole of monitoring well MW-457 and a copy of the boring log for the monitoring well is provided on the attached CD-R. A soil conductivity log was not performed at the location of monitoring well MW-457 due to the well's close proximity to monitoring well MW-357.
- March 22 through March 30, 2006: Monitoring wells MW-357 and MW-457 were developed and preliminary ground—water samples were collected and analyzed for VOCs, total alkalinity, chloride, nitrate, nitrite, sulfate, methane, ethane, and ethene analyses. Results of analyses of detected VOCs in the ground-water samples collected from these two monitoring wells in March 2006 are provided on Table 3. The results of analyses for total alkalinity, chloride, nitrate, nitrite, sulfate, ferrous and total iron, methane, ethane, and ethene are provided on Table 4. Laboratory reports of these analyses and copies of the monitoring development and sampling forms are provided on the attached CD-R.

II. Routine Monitoring

Water Level Measurements

April 3 through April 5, 2006: Depths to ground-water were measured in piezometers, monitoring wells, CMT wells, and pump test wells associated with the Coliseum Boulevard Plume Investigation. Ground-water elevations on April 3 through April 5, 2006, are provided in Tables 5a through 5f. Ground-water elevations on April 3 through April 5, 2006, in the 100- and 200-series "shallow zone" monitoring wells and piezometers are shown on Figures 1 and 2, respectively.

Depths to ground-water were measured in continuous multi-channel tubing (CMT) wells 1 through 7 (see Table 6) on April 3 through April 5, 2006. The water levels were not measured in CMT 1-2, CMT3-7 and CMT 4-7 on April 3, 2006, because of an obstruction in the well ports that prevented the water level indicator cable from freely advancing



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through the ports. CMT 3-1 was dry on April 3, 2006.

Semi-Annual Sampling Event (Modification to Addendum 13 Work Plan)

- A semi-annual event under the Modification to Addendum 13 Ground Water Monitoring Plan (dated March 17, 2005) was conducted in April 2006. Ground-water samples were collected from 90 monitoring wells at the Coliseum Boulevard Plume site for analyses for VOCs.
- April 3 through April 27, 2006: During the semi-annual event of the approved modified ground-water monitoring program, samples were collected from the following 90 wells located at the Coliseum Boulevard Plume (CBP) site.

MW-1A	MW-207	MW-117	MW-230	MW-236B	MW-243B	MW-250B
MW-2A	MW-108	MW-217	MW-131	MW-236C	MW-144A	MW-250C
MW-3A	MW-208	MW-123	MW-231	MW-137A	MW-244B	MW-151A
MW-5A	MW-109	MW-223	MW-132	MW-237B	MW-244C	MW-251B
MW-101	MW-210	MW-124	MW-232	MW-237C	MW-145A	MW-152A
MW-201	MW-111	MW-224	MW-133	MW-138A	MW-146A	MW-252B
MW-103	MW-211	MW-125	MW-233	MW-238B	MW-246B	MW-153
MW-203	MW-113	MW-225	MW-134	MW-238C	MW-147A	MW-154
MW-105	MW-213	MW-128	MW-234	MW-339	MW-247B	MW-155
MW-205	MW-115	MW-228	MW-135A	MW-340	MW-149A	MW-156
MW-106	MW-215	MW-129	MW-235B	MW-341	MW-249B	MW-357
MW-206	MW-116	MW-229	MW-235C	MW-342	MW-249C	MW-457
MW-107	MW-216	MW-130	MW-136A	MW-143A	MW-150A	

These 90 monitoring wells were sampled and analyzed for VOCs by **TTL**'s laboratory using EPA Method 8260. The ground-water samples were measured in the field for ferrous iron and total iron using a CHEMetrics VVR photometer[®]. The concentrations of detected VOCs in ground-water samples collected from the monitoring wells are shown on Plate 1 and Figure 3.

Samples were also collected from monitoring wells MW-153, MW-154, MW-155, MW-156, MW-357 and MW-457 and analyzed for inorganics (total alkalinity, chloride, nitrate, nitrite, and sulfate) by **TTL**'s laboratory and for dissolved gases (methane, ethane and ethene) by STL in Burlington, Vermont. Samples were also collected from monitoring wells MW-106, MW-206, MW-107, MW-207, MW-109, MW-130, MW-230, MW-131, MW-231, MW-135A, MW-235B, MW-235C, MW-136A, MW-236B, MW-236C, MW-137A, MW-237B, MW-237C, MW-138A, MW-238B and MW-238C and analyzed for dissolved gases (methane, ethane and ethene) by STL in Burlington, Vermont. The results of the analyses of detected VOCs in the ground-water samples collected from the monitoring wells are provided in Table 3. The results of the analyses for total alkalinity, chloride,



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nitrate, nitrite, sulfate, ferrous and total iron, methane, ethane, and ethene in the ground-water samples collected from the approved monitoring wells under the Modification to Addendum 13 are provided in Table 4. Laboratory reports of the results of the analyses of the ground-water samples collected during the month of April 2006 are provided on the attached compact disc - recordable (CD-R).

Prior to sample collection, the monitoring wells were purged using a bladder pump until field parameters (pH, conductivity, and turbidity) stabilized. Temperature and redox (ORP) were also measured in the field. The field parameter measurements during purging of the monitoring wells in the month of April 2006 are provided on the Monitoring Well Sampling Forms on the attached CD-R.

<u>April 2006</u>: Ground-water samples were collected from 9 monitoring wells (MW-106, MW-206, MW-107, MW-207, MW-223, MW-130, MW-230, MW-131, and MW-231) and analyzed for total organic carbon (TOC). The results of these analyses are provided in Table 7. Laboratory reports of the results of the analyses for TOC in the ground-water samples collected during the month of April 2006 are provided on the attached CD-R.

Quarterly Sampling of the Continuous Multi-Channel Tubing (CMT) Wells

• April 21 though April 27, 2006: Ground-water samples were collected from CMT wells 1, 2, 3 and 4. Ground-water samples were not collected from CMT 3-1 on April 25, 2006, and CMT 4-1 on April 27, 2006, due to the lack of sufficient water in the CMT ports. After measuring depths to water, each port was purged using a peristaltic pump until field parameters (pH, conductivity, and turbidity) stabilized. Ground-water samples also were measured in the field for temperature, oxidation-reduction potential [redox (ORP)], ferrous [Fe (II)] and total iron. Approximately 2 to 6 gallons of water were removed from each of the CMT ports prior to sample collection. During sample collection, the tubing from the pump was disconnected and withdrawn from the port.

The water samples were collected by draining the water from the bottom end of the tubing (end previously inside the port) into the sample containers. The ground-water samples were analyzed for VOCs by TTL's laboratory. Samples were also collected from CMT wells 1, 2 and 4 and analyzed for dissolved gases (methane, ethane and ethene) by STL in Burlington, Vermont. Results of analyses of detected VOCs in the ground-water samples collected from the CMT wells are provided in Table 8. The results of the analyses for methane, ethane and ethene are provided in Table 9. Laboratory reports of these analyses and copies of Monitoring Well Sampling Forms are provided on the attached CD-R.



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Surface Water Sampling

- March 14, 2006: A surface water sample (ZP-1) was collected from the pump intake point at the Zoo Pond. Figure 4 shows the location of the Zoo Pond sampling point. The water sample was placed on ice and transported to TTL's laboratory for analyses for VOCs. Results of analysis of detected VOCs are provided in Table 10. On March 14, 2006, the surface water sample collected from the Zoo Pond sampling location ZP-1 did not contain any of the constituents of concern related to the CBP investigation. TCE was not detected in the sample collected from the Zoo Pond. The laboratory report for the VOC analysis of the surface water sample collected on March 14, 2006, is provided on the attached CD-R.
- April 20, 2006: Surface water samples were collected from the west and main branches of Kilby Ditch at five locations (compliance points CP-1, CP-2, CP-3, and monitoring points MP-1 and MP-2), from the Zoo Ditch at one location (ZD-1) and from the Zoo Pond at one location (ZP-1). On April 20, 2006, the surface water samples were collected at each location from the central part of the respective ditches and from the pump intake point at the Zoo Pond. Figure 4 shows the locations of these six sampling points. The water samples were placed on ice and transported to TTL's laboratory for analyses for VOCs. Results of analyses of detected VOCs are provided in Table 10. The laboratory reports for the VOC analyses of the surface water samples collected on April 20, 2006, are provided on the attached CD-R. During sample collection, the water samples also were measured for temperature, pH, conductivity, dissolved oxygen, and turbidity (see Table 11).

On April 20, 2006, compliance point water samples CP-1, CP-2, and CP-3 contained 1.9J μ g/L (micrograms per liter), 1.9J μ g/L, and 1.9J μ g/L, respectively, of TCE. The J-flag associated with the concentration means the concentration is below the practical quantitation level. TCE concentrations detected in the samples collected from CP-1, CP-2 and CP-3 on April 20, 2006, are below the action level concentration of 175 μ g/L for TCE in surface water.

Surface water samples collected from monitoring point locations MP-1 and MP-2 contained TCE (2.0J μ g/L and 2.0J μ g/L, respectively) on April 20, 2006.

On April 20, 2006, the surface water sample collected from the Zoo Ditch sampling location ZD-1 contained 3.8J μ g/L of chloroform. The presence of chloroform is likely the result of the discharge of municipal water into the Zoo Ditch. TCE was not detected in the sample collected from the Zoo Ditch.

On April 20, 2006, the surface water sample collected from the Zoo Pond sampling location ZP-1 did not contain any of the constituents of concern related to the CBP investigation. TCE was not detected in the sample collected from the Zoo Pond.



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Low – Lying Areas (Addendum 04 Work Plan)

April 19, 2006: On April 19, 2006, soil/sediment and surface water samples were collected from locations N, O, and P in the "Low-Lying Areas". A surface water sample was not collected at location O on April 19, 2006, due to the absence of surface water at this location. Results of the analyses for VOCs in the soil/sediment and surface water samples collected from these locations on April 19, 2006, are provided in Tables 12 and 13, respectively. Laboratory reports of these analyses are provided on the attached CD-R.

III. Dehalococcoides Bacteria Sampling

April 13, 21, 26 and 27, 2006: Ground-water samples were collected from selected monitoring wells (MW-138A, MW-238B and MW-238C) and CMTs (1-1, 1-3, 2-3, 2-7, 4-2, 4-3, 4-4, 4-5, 4-6 and 4-7) for dehalococcoides ethenogenes bacteria analyses. Samples collected were shipped to SiRem Laboratory in Ontario, Canada. Results of the analyses of dehalococcoides bacteria collected in April 2006 are provided in Table 14. Laboratory reports of the analyses are provided on the attached CD-R.

IV. Investigation Derived Waste

Water Treatment

March 3, March 24, and April 7, 2006: Water accumulated during cleaning of sampling equipment, and purging and sampling of monitoring wells, was treated through a liquid-phase carbon filter treatment system at the ALDOT staging area. A total of 3,572 gallons of water was treated between March 3, and April 7, 2006 (see Table 15). The treated water was discharged into the sanitary sewer at the staging area. On March 3, 2006, samples were collected from water discharged from the first carbon filter to monitor for breakthrough and from the third carbon filter to monitor for compliance with the Montgomery Water Works and Sanitary Sewer Board discharge requirements. On March 24 and April 7, 2006, samples were collected from water discharged from the second carbon filter to monitor for breakthrough and from the third carbon filter to monitor for compliance with the Montgomery Water Works and Sanitary Sewer Board discharge requirements. The water samples were submitted for VOC analyses. Results of analyses of detected VOCs and volumes of treated water are provided in Table 15. Laboratory reports of the analytical results for samples collected are on the attached CD-R



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V. Quality Assurance/Quality Control

• During the April 2006 semi-annual ground-water sampling event, duplicate ground-water samples were collected from monitoring wells MW-107, MW-229, MW-230, MW-341, MW-146A, MW-155 and CMT 1-3 and CMT 4-2 and analyzed for VOCs. The duplicate sample results for the VOC analyses are shown with the parent sample results (see Tables 3 and 8). Duplicate samples for inorganic analyses also were collected from monitoring wells MW-107, MW-229, MW-230, MW-341, MW-146A, MW-155 and CMT 1-3 and CMT 4-2 during the April 2006 sampling event. The duplicate sample results for the inorganic analyses are shown with the parent sample results (see Tables 4 and 9). Ground-water samples also were collected from monitoring wells MW-101, MW-107, MW-203, MW-237B, MW-341 and MW-145A and CMT 1-5 and CMT 2-2 and shipped to TTL's laboratory to be analyzed for total iron for quality assurance/quality control purposes (see Tables 4 and 9). Equipment rinse samples were collected and trip blank samples accompanied water samples that were submitted for analyses for VOCs in April 2006. Results of VOC analyses for the rinse and trip blank samples are provided in Table 16. Laboratory reports of the analyses are provided on the attached CD-R.



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FIGURES











